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growth, and various metabolic processes of plants and animals are all considered. Many observations are of the author's own work and all are discussed with reference to the RGT rule. Indeed, one wishes that the effect of temperature on purely physical processes was more fully considered. There is of course no doubt but that the main effect of temperature on life processes is to be explained in terms of its effect on chemical reactions, nevertheless, there are irregularities in the temperature coefficients of biological processes which must be explained as the result of temperature changing two processes at the same time, and not merely the velocity of some chain of chemical reactions. It is the exception rather than the rule which should now claim the attention of physiologists.

It is always a great convenience to have the results of some one subject of investigation collected and tabulated by a competent investigator and this book will serve as an excellent reference work to the physiologist and biochemist interested in temperature and as a guide to future research along that line.

E. NEWTON HARVEY

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Geologia Elementar, preparada com referencia especial aos Estudantes Brasileiros e á Geologia do Brazil. Por JOHN C. BRANNER. Second edition, Francisco Alves et Cia, 166 Rua do Ouvidor, Rio de Janeiro, Brazil.

The second edition of this excellent handbook, not only for Brazilian students as the title states, but of Brazilian geology, brings up to date in 396 pages of text the matter presented in the first edition of the year 1906. Perhaps no one now living in or outside of Brazil is so well prepared to write a regional geology text of this character as President Branner. The present edition is based upon the first, which was written in English and translated into Portuguese with the collaboration of the late Dr. Derby. The additional matter in the new edition was written in Portuguese by the author, and revised by Doctors Barreto and Lisboa. The subject-matter is systematically set forth with illustrations of

local geological peculiarities, among which the magnificent examples of weathered rocks, the coral banks of the coast and sandstone reefs of Pernambuco, the remarkable growths of the mangrove, the geological work of ants, and the striking evidences of a slightly elevated shore-line, form admirable subjects for didactic geology. Where Brazil is now wanting in evidences of important agencies of geological change, the author has very properly, in the interest of the student, introduced striking examples from foreign lands. The North American student of geology, even if he does not read Portuguese, will find the black-line maps illustrating the distribution of the geological formations of Brazil as they are at present known, the most serviceable at his command. The guide fossils representing the chief types in the Brazilian Upper Silurian, Devonian, Jurassic, Cretaceous and Tertiary deposits are set forth in line and stipple drawings which have the merit of distinctness. Numerous cross-sections show the understanding of the geological structure, in particular the coastwise portion of the country. President Branner has embodied the latest discoveries concerning the Permian glaciation in south Brazil, as well as the results of Dr. I. C. White's monographic work upon the "Geology of the Brazilian Coal Field." The footnotes give reference to the more important geological reports on the region, among which must not be forgotten the author's "Bibliography of the Geology of Brazil," in *Bulletin Geol. Soc. Amer.*, Vol. 20, p. 132, 1909.

The geological traveller bound to Brazil will find this work indispensable as a *vademecum*, and an additional incentive to gain command of the Portuguese tongue.

J. B. WOODWORTH

Irrigation in the United States. By RAY PALMER TEELE, M.A. D. Appleton and Company, 1915. Pp. 253.

The conquest by irrigation of the vast area of our country that lies under a low annual rainfall—approximately 20 inches and less—has become a matter of national interest. Our

increasing population needs the foodstuffs that may be produced, abundantly, on the irrigated farms, and the "landless" men want the new farms upon which to build independence for themselves and their families. During the last quarter of a century, public and private capital has been poured into the irrigation enterprises of the Great West; vast tracts have been opened for settlement; serious and difficult problems have arisen, which yet await solution. Thousands of investors, great and small, in all sections of the United States, are holding irrigation securities which in many cases are of doubtful value.

As the importance of land reclamation by irrigation became more fully realized, an irrigation literature of great value was produced, which, however, concerned itself chiefly with the construction of irrigation works, or with the actual use of water on the land. Mr. Teele, in the present volume, has had in mind the needs of the great body of our citizens, wherever they may live, who, because of their interest in irrigation, desire a comprehensive yet non-technical discussion of the meaning, extent, purpose, problems and present status of irrigation in the United States. The present volume is devoted, therefore, to a "discussion of the legal, economic and financial aspects" of irrigation.

The author has accomplished his purpose admirably. After a brief discussion of the irrigated section, with respect to climate, water supply and crops, the author takes up the consideration of legislation relating to irrigation, irrigation investments and the organization and operation of irrigation enterprises. This discussion, though brief, is exceedingly clear and comprehensive, and the reader is left with a vivid picture of the real irrigation situation in our country. Elements of weakness or strength are pointed out and wise suggestions are frequently made for improvement. To the seasoned student of irrigation, the last chapter, on the present situation and future of irrigation in the United States, is of greatest interest, for it includes the author's well-reasoned conclusions concerning the methods of stabilizing the economics of irrigation.

The book should be read and studied by national and state legislators, who have to do with the making of irrigation laws; by the projector of new irrigation enterprises; by the investor; by the man on the irrigated farm, and by all who are interested in the gigantic movement to conquer all of our Great West for the use of man.

Mr. Teele is particularly well fitted to speak with authority on irrigation subjects. Through his editorial hands have passed practically every irrigation publication issued by the U. S. Department of Agriculture since 1899. He is personally familiar with the irrigated section, and is an enthusiastic believer in irrigation, though he has never closed his eyes to its difficulties. Irrigation in its present stage of development needs honest friends.

The survey in this volume is so brief that we hope the author may some time find time to enlarge upon his theme for the technical student. Moreover, we shall not know the full meaning of irrigation until its sociological aspects are examined, and this volume only hints at the conditions of human life under the ditch. Nevertheless, Mr. Teele's book is a great contribution to irrigation advancement in that it brings order out of a confusion of knowledge, and points out the way by which our present irrigation difficulties may be overcome.

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SPECIAL ARTICLES

ON THE PHYSICAL CHEMISTRY OF EMULSIONS AND ITS BEARING UPON PHYSIOLOGICAL AND PATHOLOGICAL PROBLEMS

I

WE have been engaged during the past few months in a study of the conditions which determine the making and the breaking of emulsions. In addition to verifying certain well-known observations, this inquiry has brought some new points of view which are of importance for the theory of the stability of emulsions, and for the solution of such technical and biological problems as are embraced in the making of butter, the preparation of thera-